5.10 Water Resources

Water resource impacts were evaluated by reviewing information from a number of sources and by conducting field surveys. Information on public drinking water supply sites, both surface and underground water supplies, wellhead protection areas, and impaired streams was obtained through digital GIS files from IDEM. In addition to these GIS sources, the 2001 Indiana 305(b) Report on the Lower Wabash and Upper Illinois Basins, and a number of local studies and papers have been reviewed for ambient conditions.

Impacts to water resources were evaluated for both short-term impacts resulting from the construction of the highway as well as potential long-term impacts of runoff and continual maintenance of the highway.

5.10.1 Surface Water

The US 31 project area is primarily within the Yellow River drainage basin, of the Kankakee River watershed, and to a lesser extent the St. Joseph River watershed. The Yellow River is crossed by all of the alternatives along the existing alignment of US 31. It is possible that US 31 may need to be widened in this area and the existing bridge replaced. If this occurs, impacts to the Yellow River are expected to be minimal. All of the streams crossed by each of the alternatives are reported in Tables 5.10.31 through 5.10.34.

Table 5.10.31: Alternative Cs (Estimated Stream Impacts)

Stream Name	Watershed	OHWM Width (ft)	Length (ft)	Area (ft2)	Area (acres)
Elmer Seltenright Ditch	Kankakee	22.0	318	6996	0.16
Unnamed Ditch*	Kankakee	4.0	360	1440	0.03
Elmer Seltenright Ditch	Kankakee	20.0	587	11,740	0.27
Unnamed Trib of Lehman Ditch*	Kankakee	6.0	459	2754	0.06
Lehman Ditch	Kankakee	14.0	362	5068	0.12
Mangun Arm of Lehman Ditch	Kankakee	9.0	309	2781	0.06
Unnamed Trib of Lehman Ditch	Kankakee	8.0	333	2664	0.06
Unnamed Trib of Riddles Lake*	Kankakee	10.0	1202	12,020	0.28
Unnamed Trib of Heston Ditch	Kankakee	10.0	907	9070	0.21
Heston Ditch	Kankakee	7.0	380	2660	0.06
Ditch (Dennis Schaeffer)	Kankakee	9.0	149	1341	0.03
Unnamed Trib of Shidler-Hoffman Ditch	Kankakee	2.0	338	676	0.02
Auten Ditch*	St. Joseph	3.0	501	1503	0.03
Unnamed Trib of Auten Ditch	St. Joseph	7.0	325	2275	0.05
Auten Ditch	St. Joseph	8.0	323	2584	0.06

Table 5.10.31: Alternative Cs (Estimated Stream Impacts) (Continued)					
Stream Name	Watershed	OHWM Width (ft)	Length (ft)	Area (ft2)	Area (acres)
Unnamed Trib of Philips Ditch*	St. Joseph	5.0	1822	9110	0.21
Philips Ditch*	St. Joseph	8.0	1280	10240	0.24
Auten Ditch	St. Joseph	8.0	156	1248	0.03
		Totals:	10,111	86,170	1.98

Source: Bernardin-Lochmueller & Associates, Inc. (2004)
Note: * Denotes a possible ditch rechannelization.

Table 5.10.32: Alternative Es (Estimated Stream Impacts)					
Stream Name	Watershed	OHWM Width (ft)	Length (ft)	Area (ft2)	Area (acres)
Elmer Seltenright Ditch	Kankakee	22.0	318	6996	0.16
Unnamed Ditch*	Kankakee	4.0	360	1440	0.03
Elmer Seltenright Ditch	Kankakee	20.0	587	11,740	0.27
Unnamed Trib of Lehman Ditch*	Kankakee	6.0	459	2754	0.06
Lehman Ditch	Kankakee	14.0	362	5068	0.12
Mangun Arm of Lehman Ditch	Kankakee	9.0	309	2781	0.06
Unnamed Trib of Lehman Ditch	Kankakee	8.0	333	2664	0.06
Unnamed Trib of Riddles Lake*	Kankakee	10.0	1202	12,020	0.28
Unnamed Trib of Heston Ditch	Kankakee	10.0	907	9070	0.21
Heston Ditch	Kankakee	7.0	380	2660	0.06
Ditch (Dennis Schaeffer)	Kankakee	9.0	149	1341	0.03
Unnamed Trib of Shidler-Hoffman Ditch	Kankakee	2.0	338	676	0.02
Auten Ditch	Kankakee	3.0	116	348	0.01
Unnamed Trib of Auten Ditch	St. Joseph	2.5	302	755	0.02
Unnamed Trib of Auten Ditch	St. Joseph	6.0	303	1818	0.04
Unnamed Trib of Auten Ditch	St. Joseph	3.0	331	993	0.02
Unnamed Trib of Auten Ditch	St. Joseph	5.0	335	1675	0.04
Philips Ditch	St. Joseph	10.0	355	3550	0.08
Philips Ditch*	St. Joseph	12.0	1520	18240	0.42
		Totals:	8,966	86,589	1.99

Source: Bernardin-Lochmueller & Associates, Inc. (2004)
Note: * Denotes a possible ditch rechannelization.

Table 5.10.33: Alternative G-Cs (Estimated Stream Impacts)					
Stream Name	Watershed	OHWM Width (ft)	Length (ft)	Area (ft2)	Area (acres)
Elmer Seltenright Ditch	Kankakee	22.0	318	6996	0.16
Unnamed Ditch*	Kankakee	4.0	360	1440	0.03
Elmer Seltenright Ditch	Kankakee	20.0	587	11,740	0.27
Unnamed Trib of Lehman Ditch*	Kankakee	6.0	459	2754	0.06
Lehman Ditch	Kankakee	14.0	362	5068	0.12
Mangun Arm of Lehman Ditch	Kankakee	9.0	309	2781	0.06
Unnamed Trib of Lehman Ditch	Kankakee	8.0	319	2552	0.06
Unnamed Ditch	Kankakee	3.0	425	1275	0.03
Unnamed Trib of Lehman Ditch	Kankakee	4.0	405	1620	0.04
Heston Ditch	Kankakee	16.0	366	5856	0.13
Shidler-Hoffman Ditch	Kankakee	13.0	531	6903	0.16
Unnamed Trib of Bunch Ditch (East Branch)	Kankakee	15.0	308	4620	0.11
Bunch Ditch	Kankakee	15.0	118	1770	0.04
Unnamed Ditch*	St. Joseph	6.0	393	2358	0.05
Unnamed Ditch*	St. Joseph	4.0	533	2132	0.05
Unnamed Trib of Philips Ditch*	St. Joseph	5.0	92	460	0.01
Philips Ditch*	St. Joseph	8.0	1280	10240	0.24
Auten Ditch	St. Joseph	8.0	156	1248	0.03
		Totals:	7,321	71,813	1.65

Source: Bernardin-Lochmueller & Associates, Inc. (2004)
Note: * Denotes a possible ditch rechannelization.

Table 5.10.34: Preferred Alternative G-Es (Estimated Stream Impacts)					
Stream Name	Watershed	OHWM Width (ft)	Length (ft)	Area (ft2)	Area (acres)
Elmer Seltenright Ditch	Kankakee	22.0	318	6996	0.16
Unnamed Ditch*	Kankakee	4.0	360	1440	0.03
Elmer Seltenright Ditch	Kankakee	20.0	587	11,740	0.27
Unnamed Trib of Lehman Ditch*	Kankakee	6.0	459	2754	0.06

Table 5.10.34: Preferred Alternative G-Es (Estimated Stream Impacts) (Continued)					
Stream Name	Watershed	OHWM Width (ft)	Length (ft)	Area (ft2)	Area (acres)
Lehman Ditch	Kankakee	14.0	362	5068	0.12
Mangun Arm of Lehman Ditch	Kankakee	9.0	309	2781	0.06
Unnamed Trib of Lehman Ditch	Kankakee	8.0	319	2552	0.06
Unnamed Ditch	Kankakee	3.0	425	1275	0.03
Unnamed Trib of Lehman Ditch	Kankakee	4.0	405	1620	0.04
Heston Ditch	Kankakee	16.0	366	5856	0.13
Shidler-Hoffman Ditch	Kankakee	13.0	531	6903	0.16
Unnamed Trib of Bunch Ditch (East Branch)	Kankakee	15.0	308	4620	0.11
Bunch Ditch	Kankakee	15.0	118	1770	0.04
Unnamed Ditch*	St. Joseph	6.0	393	2358	0.05
Unnamed Ditch*	St. Joseph	4.0	533	2132	0.05
Philips Ditch	St. Joseph	10.0	355	3550	0.08
Philips Ditch*	St. Joseph	12.0	1520	18240	0.42
		Totals:	7,668	81,655	1.87

Source: Bernardin-Lochmueller & Associates, Inc. (2004)
Note: * Denotes a possible ditch rechannelization.

Tables 5.10.31 to 5.10.34 identify estimated stream impact lengths from 7,321 to 10,111 feet including 1.65 to 1.99 acres of impacts below ordinary high water marks (OHWM) for the alternatives. Streams exhibiting an OHWM and downstream connectivity to other waters of the US (which all streams crossed by the project do) are under the jurisdiction of the USACE under Section 404 of the Clean Water Act. Any impacts to these streams below the OHWM are subject to a USACE Section 404 permit as well as an IDEM Section 401 Water Quality Certification as described in Section 5.17, Permits. Ordinary high water mark widths were measured in the field. Additional ditches have been added and some OHWM widths have been revised since publication of the DEIS. Impact lengths were estimated based on aerial photography review. The area of impact was estimated by multiplying the length of the impact by the average width at the OHWM. The No-Build Alternative will have no significant stream impacts.

Stream rechannelizations may be applicable. Alternative Cs would require six rechannelizations (unnamed ditch, unnamed tributary of Lehman Ditch, unnamed tributary of Riddles Lake, Auten Ditch headwaters, unnamed tributary of Philips Ditch, and Philips Ditch). Alternative Es would require four rechannelizations (unnamed ditch, unnamed tributary of Lehman Ditch, unnamed tributary of Riddles Lake, and Philips Ditch). Alternative G-Cs would require six rechannelizations (unnamed ditch, unnamed tributary of Lehman Ditch, unnamed ditch, unnamed ditch, unnamed tributary of Philips Ditch, and Phillips Ditch). Preferred Alternative G-Es will require five rechannelizations (unnamed ditch, unnamed tributary of Lehman Ditch, unnamed ditch, unnamed ditch, and Philips

Ditch). All of the streams requiring rechannelization are excavated drainage ditches or previously channelized and straightened streams. The majority, with the exception of Philips Ditch, are small ephemeral ditches. It may be possible to avoid some of these rechannelizations during the design phase.

More detailed descriptions of potential stream and ditch impacts for Preferred Alternative G-Es, including pictures and figures, can be found in the report titled, "Waters of the US" Verification Report US 31 Improvement Project, Plymouth to South Bend, Revised on May 2, 2005. Representatives from the USACE Detroit District and IDEM reviewed proposed wetland impacts during a field review on November 4 – 6, 2004. At this time, agency representatives were able to assess impacts based on their professional opinion.

Approximately of 7,668 feet of streams and ditches at 17 separate impact (18 including the Yellow River) locations are within the proposed Preferred Alternative G-Es footprint and are expected to be impacted at this time. The majority of these streams have been previously altered from farming practices, pass through agricultural fields, and have little to no tree cover. Most had a trapezoidal channel shape with steep banks, and a silt (soft) substrate. Riffle/pool complexes were infrequent to nonexistent. Several of these ditches were seined for fishes and showed a number of species tolerant to distressed habitats and low oxygen concentrations. Twelve (12) of the 17 crossings are considered regulated drains in Marshall and St. Joseph Counties, while the remaining are small ephemeral (1 small perennial) streams. The County Surveyor and County Drainage Boards are the technical authority on the construction, reconstruction, and maintenance of all regulated drains or proposed regulated drains in the county. Impacts to streams as part of this project typically include bridge or culvert construction.

Stream impacts will be mitigated such that the functions of the stream impacted are replaced. Possible mitigation measures include, but are not limited to, riparian plantings, bank stabilization, and in-stream habitat improvements. Stream mitigation will be completed following the requirements of all appropriate review agencies.

Open water impacts are limited for the alternatives. No large natural lakes within the project area will be directly impacted. The open water areas were generally small, excavated ponds with a wetland fringe. Open water impacts total less than an acre for each alternative. See Section 5.12, Wetlands, for a detailed description of wetland impacts.

5.10.2 Water Quality

Fish were sampled and basic water quality parameters were tested at 12 stream locations within the study area. Sample locations were included for each of the four alternatives. All measurements were conducted on-site and according to manufacturers instructions. Table 5.10.35 lists the parameters that were measured and equipment used. Prior to each daily use, the pH probe was calibrated and checked against Oakton buffered standards of 7.00, 4.01 and 10.00, in that order. Grab samples from each stream were obtained in clean plastic bottles. Tests for chloride, iron, hardness, alkalinity, phosphate and nitrate were either conducted on site, or were performed later the same day using stored samples.

Table 5.10.35. Water Quality Survey Parameters and Instrumentation			
Parameter	**Instrument/Method**	**Units**	**Accuracy**
pH	Oakton™ pHTestr 2™	standard units	±0.1 pH
Air temp.	YSI Model 85 Handheld Oxygen, Conductivity, Salinity, and Temperature System	8C	±0.1 8C (±1 lsd)
Water temp.		8C	±0.1 8C (±1 lsd)
Conductivity		mS	±0.5% FS
Specific Conductance		mS	±0.5% FS
DO		mg/l	±0.3 mg/l
DO % saturation		% air sat.	±2% air sat.
Salinity		ppt	±0.1 ppt or ±2%
Total Alkalinity	LaMotte Model WAT-MP-DR	ppm $CaCO_3$	N/A
Total Hardness	LaMotte Model PHT-CM-DR-LT	ppm $CaCO_3$	N/A
Chloride	LaMotte Model PSC-DR	ppm Cl	N/A
Iron	LaMotte Model P-61	ppm Fe	N/A
Phosphate	LaMotte Model VM-12	ppm PO_4	N/A
Nitrate-Nitrogen	LaMotte Model NCR	ppm NO_3-N	N/A

A 10’ seine (0.25” mesh) was used for the fish collections. Table 5.10.36 lists the 12 sample locations, the Index of Biotic Integrity scores (discussed below) for each stream, and the alternatives that would cross that stream. Aquatic data sheets showing water chemistry and fish collection results for each sample location can be found in Appendix M.

Table 5.10.36: Stream Water Quality & Fish Sampling Locations						
Site	**Stream**	**IBI Score**	**Alt. Cs**	**Alt Es**	**Alt. G-Cs**	**Alt. G-Es (Preferred)**
1	Elmer-Seltenright Ditch #1	38 (Poor-Fair)	X	X	X	X
2	Elmer-Seltenright Ditch #2*	16 (Very Poor)	X	X	X	X
3	Lehman Ditch	24 (Very Poor-Poor)	X	X	X	X
4	Unnamed Trib. of Lehman Ditch	46 (Fair-Good)	X	X	X	X
5	Heston Ditch #1	44 (Fair)			X	X
6	Unnamed Trib. of Bunch Ditch	19 (Very Poor)			X	X
7	Unnamed Trib. of Riddles Lake	18 (Very Poor)	X	X		
8	Heston Ditch #2	34 (Poor)	X	X		

Site	Stream	IBI Score	Alt. Cs	Alt Es	Alt. G-Cs	Alt. G-Es (Preferred)
9	Ditch (Dennis Schaeffer)	No Fish	X	X		
10	Auten Ditch	No Fish	X			
11	Unnamed Trib. of Auten Ditch	No Fish		X		
12	Unnamed Trib. of Heston Ditch	16 (Very Poor)	X	X		

Table 5.10.36: Stream Water Quality & Fish Sampling Locations (Continued)

The ambient condition of each sample location was evaluated using the Index of Biotic Integrity (IBI). This index relies on multiple parameters (termed "metrics") based on community concepts, to evaluate a complex system. It incorporates professional judgment, but sets quantitative criteria that enables determination of what is poor and excellent based on species richness and composition, trophic and reproductive constituents, and fish abundance and condition. Table 5.10.37 lists the total IBI scores, corresponding integrity class, and attributes of each.

Table 5.10.37: Attributes of Index of Biotic Integrity (IBI) Classification, Total IBI Scores, & Integrity Classes

Total IBI Score	Integrity Class	Attributes
58 - 60	Excellent	Comparable to the best situation without human disturbance; all regionally expected species for the habitat and stream size, including the most intolerant forms, are present with a full array of age (size) classes; balance trophic structure
48 - 52	Good	Species richness somewhat below expectation, especially due to the loss of the most intolerant forms; some species are present with less than optimal abundances or size distributions; trophic structure shows some signs of stress
40 - 44	Fair	Signs of additional deterioration include loss of intolerant forms, fewer species, highly skewed trophic structure (e.g. increasing frequency of omnivores and other tolerant species; older age classes of top predators may be rare
28 - 34	Poor	Dominated by omnivores, tolerant forms, and habitat generalists; few top carnivores; growth rates and condition factors commonly depressed; hybrids and diseased fish often present
12 - 22	Very Poor	Few fish present, mostly introduced or tolerant forms; hybrids common; disease, parasites, fin damage, and other anomalies regular
	No Fish	Repeated sampling finds no fish

Total IBI scores for the streams sampled ranged from 16 to 46. No fish were collected at Sites 9, 10, and 11. Four sites ranked Very Poor (Sites 2, 6, 7, and 12), one site ranked Very Poor-Poor (Site 3), one site ranked Poor (Site 8), one site ranked Poor-Fair (Site 1), one site ranked Fair (Site 5), and one site ranked Fair-Good (Site 4). The majority of the fish species collected were tolerant of stressed conditions or showed an intermediate tolerance. The fish species collected at each site are listed in Appendix M. The vast majority of streams sampled showed evidence of human disturbance for agricultural and/or drainage purposes. Most had little or no riparian cover. The IBI scores suggest that previous human alteration has adversely affected water quality within the study area.

Each seining location was also tested for basic water quality parameters. The pH values ranged from 7.4 to 8.7. This pH range meets the Indiana minimum water quality standards for aquatic life of 6.0 to 9.0. Daytime dissolved oxygen levels ranged from 2.14 to 9.55 mg/L; however, it is believed there was a problem with the probe at the majority of the locations. Dissolved oxygen levels were retested at four locations and levels ranged from 6.79 to 9.55 mg/L. These levels are believed to be more accurate. Indiana minimum water quality standards for aquatic life state that dissolved oxygen levels must average 5.0 mg/ L per day and shall not be less than 4.0 mg/L at any time. Dissolved oxygen in good fishing waters generally average 9.0 mg/L, and levels lower than 3.0 mg/L kill all fish. Other parameters measured included temperature, conductivity, specific conductance, dissolved oxygen percent saturation, salinity, alkalinity, total hardness, chloride, iron, phosphate, and nitrate. Results are listed in Appendix M.

Water resource impacts are not expected to be significant in crossing the potentially impacted ditches. The majority of the streams crossed are intermittent or ephemeral in nature and do not contain substantial aquatic or riparian habitat. Fish kills have been reported in the Yellow River (1,500 fish) and Elmer Seltenright Ditch (25 fish) of Marshall County (305B Report, 1989). No fish kills have been reported in St. Joseph County. The aquatic habitat value is moderate to low in these ditches, while riparian habitat is moderate to negligible (The Water Resource, 1990). Section 303(d) of the Clean Water Act requires states to identify waters that do not or are not expected to meet applicable water quality standards. States also are required to develop a priority ranking for these waters, taking into account the severity of the pollution and the designated uses of the water. The list prepared pursuant to this requirement is known as the 303(d) List of Impaired Water Bodies.

Three streams within the project area are included on the 2002 303(d) list. These include the Yellow River-Milner Seltenright Ditch, Elmer Seltenright Ditch, and Aldrich Ditch-Schang Ditch (also identified as East Branch of Bunch Ditch). The Yellow River will be crossed by all alternatives along the existing alignment of US 31 and the existing bridges will be used. The Elmer Seltenright Ditch will be crossed by each alternative twice. One crossing will be at the location of the existing US 31 crossing; however, new bridges will be required, while the other crossing will be a new terrain location. The Elmer Seltenright Ditch is listed as partially supporting aquatic life for 3.85 miles with a moderate rating for the biotic community status.

Roadway runoff can have impacts to the water quality of streams crossed by highways as well as water quality downstream. Highway runoff can contain particulates, nitrogen, phosphorus, metals, cyanide, deicing salts (sodium, calcium, chloride), sulfates, petroleum, pesticides, PCBs, rubber, pathogenic bacteria, and asbestos. Effects of these contaminants depend on the project location, environmental setting, and the characteristics of receiving waters. Different contaminants will also have different biological effects based on the physical and chemical properties of the constituent, concentrations found in the environment, the sensitivities of organisms to adverse physical and chemical characteristics of the runoff, and the ability of the system and the individual organism to assimilate a particular constituent or a given mixture of constituents (Buckler and Granato, 1999). Primary sources of these constituents include deicing chemicals, tire wear, engine and moving part wear, exhaust, motor lubricant leaks and blow-by, roadside fertilizing and spraying, and atmospheric deposition.

The use of deicing chemicals is the most economical method available to provide bare pavement conditions for safer winter driving on highways. However, a variety of environmental consequences have been associated with the use of these materials and their associated additives. Deicing salts and chemicals draining from roads into nearby streams can cause changes in water quality, especially under low flow conditions. Weak biodegradable acids like calcium magnesium acetate and potassium acetate are more environmentally sensitive deicing compounds compared to sodium chloride, calcium chloride and magnesium chloride. Increased salt concentrations can cause osmoregulatory problems and toxicity in freshwater aquatic animal life that lack effective means of eliminating salt from their bodies and have difficulty adapting to sudden increases in salinity. The effects of salt concentrations on aquatic life vary considerably. Concentrations as high as 2,000 to 3,000 ppm have been tolerated by freshwater species such as largemouth bass and brown trout (McKee and Wolf, 1963). On the other hand, concentrations as low as 400 ppm cannot be tolerated by some species of fish (FHWA Environmental Technology Brief). Salt concentrations of 1,500 ppm are generally considered suitable for use as drinking water for livestock and wildlife (McKee and Wolf, 1963). Concentrations greater than 1 percent will endanger the health, reproduction and longevity in all species adapted to freshwater environments (Terry, 1974). Elevated salt concentrations also increase the suspended solid load, thus increasing water temperature and reducing dissolved oxygen.

In addition to aquatic animals, trees, shrubs and other vegetation along or near a roadway treated with deicing salts can also be adversely affected by runoff and airborne deposits. Damage generally occurs through two mechanisms: increased salt concentration in soil and soil water, which can result in salt absorption through roots, and salt accumulation on foliage and branches due to splash and spray (Transportation Research Board, 1991). Salt inhibits plant growth by changing soil structure, changing naturally occurring osmotic gradients and through chloride ion toxicity (NCHRP, 1976). Excess salinity causes moisture stress in plants, suppresses proper nutrient uptake, and leads to deficiencies in plant nutrition (NCHRP, 1978). As with aquatic animals, some species of trees such as red oak, white oak, red cedar, black locust, quaking aspen, and birches are more salt tolerant than are other species like red pine, speckled alder, sugar maple, hemlock (Transportation Research Board, 1991).

Deicing chemical additives in roadway runoff can also result in adverse effects to organisms or undesirable side effects in adjacent lands. Cyanide ion byproducts from sodium ferrocyanide used to prevent caking of deicing chemicals may be toxic to humans, animals and fish when occurring in sufficient concentrations. Phosphorus used as a rust inhibitor in road salts can promote the growth of unwanted aquatic plants or algae in lakes (FHWA Environmental Technology Brief).

The release of hazardous and potentially harmful materials into adjacent surface and subsurface waters from spill events along highways is always a point of concern both during and subsequent to construction. This is especially true when the highway is anticipated to support a large volume of semi-trucks transporting a wide variety of such substances. Since each of the alternatives for US 31 would cross a number of streams, this potential exists for all of the alternatives.

During construction of US 31, any spill incidents on site will be handled in accordance with INDOT spill response protocol as outlined in their Construction Activity Environmental Manual and Field Operations Manual Procedure 20. The Environmental Manual states that:

> Hazardous material releases, oil spills, fish/animal kills and radiological incidents must be reported to Office of Emergency Response, IDEM. This should occur as soon as action has been taken to either contain/control the extent of the release and protect persons, animals or fish from harm or further harm. Appropriate response actions for spills occurring on project sites, in order:

1) Identify the spilled material from a safe distance,
2) Contain the spilled material or block/restrict its flow using absorbent booms/pillow, dirt, sand or by other available means,
3) Cordon off the area of the spill,
4) Deny entry to the cordoned off area to all but response personnel, and
5) Contact OER/IDEM then Operations Support.

Following construction of US 31, emergency spill response concerning hazardous materials transported along the highway will be handled by local fire departments and regional hazardous materials units. Currently, law enforcement and nearly all fire departments within the project area possess either awareness level or operations level capabilities for responding to hazardous material spills or releases. Awareness includes the recognition of hazardous material placards and the means to cordon off an incident site. Operations level includes booms for diking spills, personal protection equipment to work within contaminated sites, and other basic containment equipment. If called upon, INDOT state highway equipment and resources can also be deployed to assist in containment anywhere along the proposed freeway.

Indiana's State Emergency Commission has recently established eleven Regional Response Teams throughout the state, each of which will have full Level A hazardous materials response capabilities. Currently, the South Bend Fire Department is the only regional unit with Level A capabilities within the project area.

5.10.3 Groundwater

Currently in Indiana, only the St. Joseph Aquifer has the designation of "sole source aquifer" (SSA). According to the "Water Resource Availability in the St. Joseph River Basin, Indiana" (IDNR Division of Water, 1987), the limits of the St. Joseph SSA are over two miles from the nearest alternative. (Figure 5.10.51) As such, the project will not have any direct impact on this aquifer.

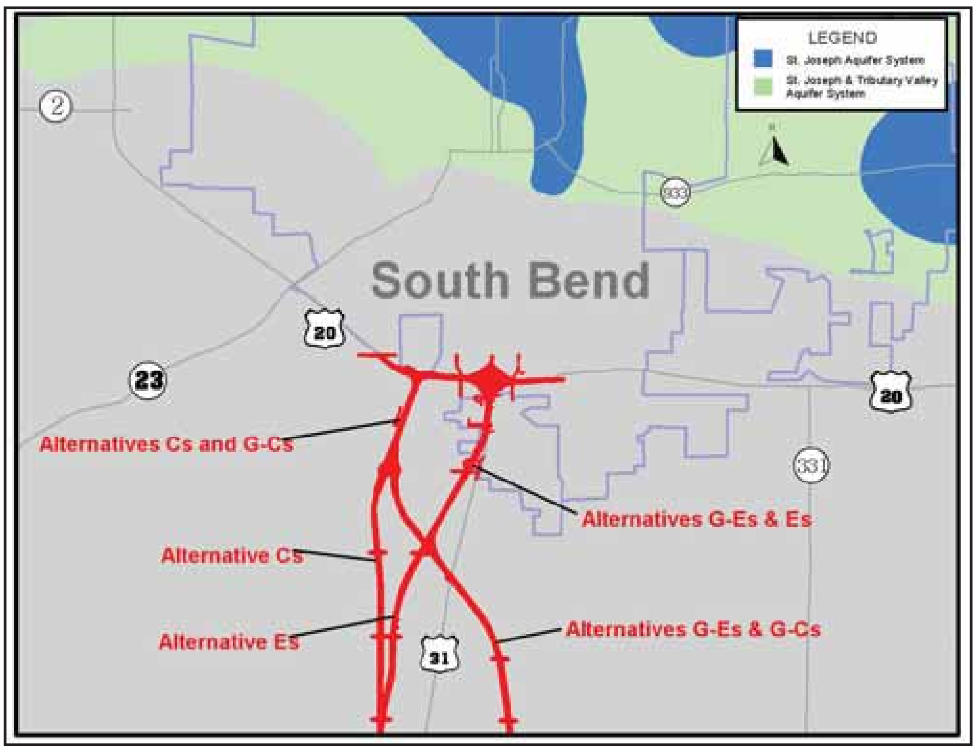

Figure 5.10.51: St. Joseph Aquifer System

Other aquifers underlie huge portions of the State of Indiana, including essentially all of the project area. The aquifer systems included within the project area are the Maxinkuckee Moraine Aquifer System, Nappanee Aquifer System, and the Hilltop Aquifer System. All of these aquifers have been developed to some degree for public drinking water use. Some of these areas have been designated by IDEM as "wellhead protection areas" (WHPA). There are currently six designated WHPAs in the project area.

It has been and continues to be INDOT's standard policy to design and construct roads to protect both surface and ground water supplies, regardless of where the project is located. INDOT also has emergency management procedures in place should a hazardous spill occur. These procedures can be activated very quickly to protect ground water.

IDEM's Office of Water Quality, Drinking Water Branch has developed a Capacity Development Strategy as required by the 1996 Amendments to the Safe Drinking Water Act (SDWA). The capacity development provisions of the Act focus on the enhancement and maintenance of the technical, management, and financial capabilities of public water supplies. IDEM is required to assist existing public drinking water systems in acquiring and maintaining these capacities.

In order to accomplish this, public drinking water systems are evaluated by IDEM for compliance with Safe Drinking Water standards as set forth in 327 IAC 8. IDEM has developed a set of criteria to identify systems which are in need of further evaluation. IDEM has also developed a "Capacity Development – A Self-Assessment Manual for Indiana's Public Water Systems" to assist public water systems to identify any areas which need improvement to assure safe drinking water for existing and future customers. Development or expansion of community based public water systems requires a construction permit to be submitted, reviewed, and approved by the Permits Section of the Drinking Water Branch. The current regulations require that modifications or additions of facilities, equipment, or devices that will include new treatment plants, water storage tanks, booster stations, wells or chemical feed systems be designed and stamped by a Professional Engineer and submitted for a Construction Permit prior to starting construction.

The course of land development along the alternatives will vary according to existing and future activities in the area. An evaluation of the existing public water supply systems will be required and construction permits received from the regulatory agency prior to any additional expansion of customers.

The No-Build Alternative will have no significant impacts to groundwater. The development of any of the freeway alternatives is not likely to have a significant effect on drinking water supplies. While all alternatives cross public water supply wellhead protection areas, all but two of these areas are currently crossed by the existing US 31 and US 20. The two additional wellhead protection areas are located southwest of the existing US 31/US 20 interchange in the vicinity of all four alternatives. Alternative Cs crosses both of these areas while Alternatives Es and G-Cs each cross one of the areas. Preferred Alternative G-Es only crosses the two wellhead protection areas currently crossed by the existing US 31 and US 20. By improving the geometrics of the interchange area, safety will be improved and the likelihood of a spill will probably decrease. Emergency spill response in these areas would be able to contain potential contamination before it could threaten the water supply. In addition, any typical roadway runoff would most likely be filtered out of the water as it infiltrates through the soil to the groundwater.

The aquifer systems crossed range from slightly susceptible to highly susceptible to contamination depending on local conditions. In highly susceptible areas where the potential exists for rapid movement of contaminants into the ground due to surficial sand and gravel deposits or the lack of a clay rich layer, special filtration and containment measures will be provided to address potential spills and runoff in these areas. These measures are identified in Chapter 6, Mitigation. Private water supply wells in proximity to the alternatives would also be protected by these measures.

5.10.4 Special Status Streams

No Wild and Scenic Rivers will be impacted by any of the alternatives. Additionally, no Outstanding State Resource Waters, Exceptional Use Streams, or streams on the Listing of Outstanding Rivers and Streams maintained by IDNR will be impacted by any of the alternatives. None of these resources are present in the project area as described in Section 4.10.3.

5.10.5 Summary

Each of the alternatives has the potential to cause impacts on water resources. In order to assess these potential impacts, this section identifies in broad terms the types of water resources crossed by each alternative, which includes the following.

- Open Water – lakes and ponds identified from NWI maps, field inspection and inspection of aerial photographs, and USGS topographic quadrangles
- Streams – a watercourse exhibiting an ordinary high water mark identified during field inspection
- Wetlands – a wetland identified on National Wetland Inventory maps, excluding PUB designations; also includes farmed wetland estimations
- Public Water Supplies – surface and underground public water supplies developed by the USEPA
- Public Wells – public water supply well sites located by GPS developed by IDEM
- Wellhead Protection Areas – the surface and subsurface area which contributes water to a public water supply well and through which contaminants are likely to move through and reach the well over a specified period of time

Table 5.10.38: Comparison of alternatives for potential water resource impacts.

Alternatives	Open Water (Acres)	Number of Streams	Stream Length (Feet)	Wetland Acres	Public Water Supplies	Public Wells*	Wellhead Protection Areas # (Acres)*
Cs	0.4	18	10,111	51.6	0	0	5 (171)
Es	0.3	19	8,966	35.6	0	0	4 (160)
G-Cs	0.7	18	7,321	30.7	0	0	3 (101)
G-Es (Preferred)	0.5	17	7,668	23.9	0	0	2 (123)

Note: This table identifies potential impacts for comparison; it does not incorporate mitigation potential.
*Public wells and wellhead protection areas were provided by IDEM.

It is important to note that the number of crossings of a particular resource type do not necessarily correlate with the overall magnitude of impact. The actual impacts will depend on many factors, including the design of the roadway. The data presented in Table 5.10.38 is useful as a basis for identifying potential issues of concern related to water resources because it indicates the types of water resource issues that would need to be addressed for each alternative.

Water quality conditions in the project area range from moderately to severely degraded, with few exceptions. A review of the alternatives shows a high probability of impacts to wetlands. The No-Build Alternative will have no impact on these water resources.

The majority of water resource impacts would come from the loss of wetlands in the project area. Wetlands play a major role in maintaining Indiana's water quality. Wetlands absorb excess inorganic and organic nutrients such as farm fertilizers and septic system runoff, filter sediments such as eroded soil particles, and trap pollutants such as pesticides and some heavy metals. These materials can seriously degrade the quality of groundwater and surface water resources, but wetlands trap and hold them, "recycling" some of them within the wetland system. See Section 5.12 for a detailed description of wetland impacts.

Mitigation measures for impacts to water resources will include, as appropriate, bridging floodplains and oxbows, minimizing channel clearing and relocations, especially for impaired streams, and utilizing erosion control devices. In areas highly susceptible to groundwater contamination, the use of special filtration and containment measures will address potential spills and runoff. INDOT will follow its emergency spill response procedures should any contaminate from the roadway threaten water resources. Implementation of the appropriate mitigation measures as identified here and in Chapter 6, Mitigation, will ensure that impacts on water resources from the project will be minimized.

Summary of Preferred Alternative G-Es

Approximately 7,668 feet of streams and ditches at 17 separate impact (18 including the Yellow River) locations are within the proposed Preferred Alternative G-Es footprint and are expected to be impacted at this time. The majority of these streams have been previously altered from farming practices, pass through agricultural fields, and have little to no tree cover. Most had a trapezoidal channel shape with steep banks, and a silt (soft) substrate. Riffle/pool complexes were infrequent to nonexistent.

Fish were sampled and basic water quality parameters were tested at 12 stream locations within the study area. The ambient condition of each sample location was evaluated using the Index of Biotic Integrity (IBI). IBI scores for Preferred Alternative G-Es ranged from 16 (Very Poor) to 46 (Fair-Good).

Three streams to be crossed by Preferred Alternative G-Es are included on the 2002 303(d) list. These include the Yellow River-Milner Seltenright Ditch, Elmer Seltenright Ditch, and Aldrich Ditch-Schang Ditch (also identified as East Branch of Bunch Ditch).

Preferred Alternative G-Es will not cross any sole source aquifers.

Preferred Alternative G-Es only crosses the two wellhead protection areas currently crossed by the existing US 31 and US 20. By improving the geometrics of the interchange area, safety will be improved and the likelihood of a spill will probably decrease.

No Wild and Scenic Rivers, Outstanding State Resource Waters, Exceptional Use Streams, or streams on the Listing of Outstanding Rivers and Streams will be impacted by Preferred Alternative G-Es.